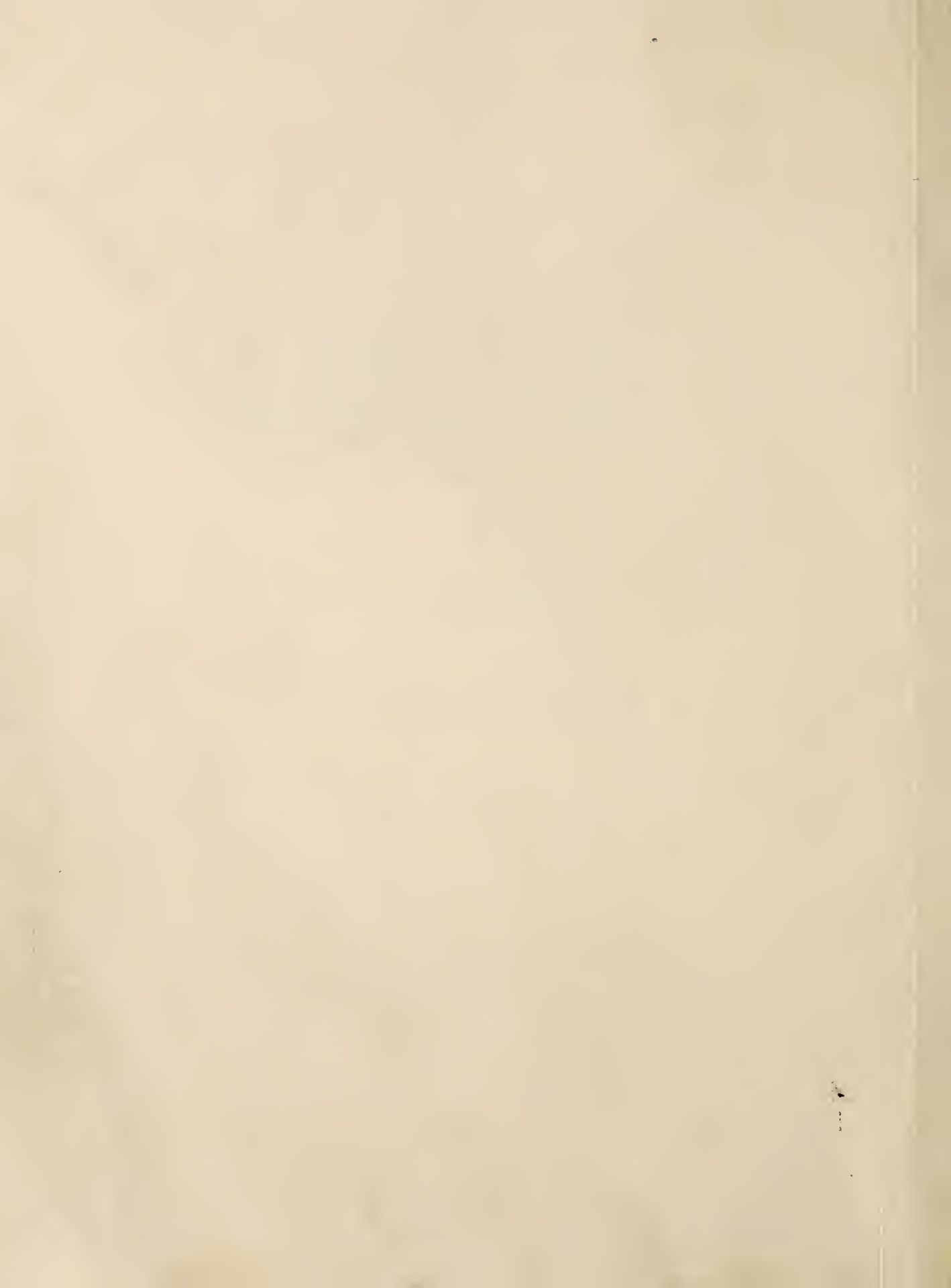


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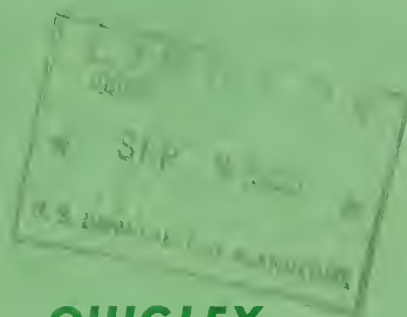
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TIMBER

HARVEST

REVEALED IN STUMPS



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Frontispiece.--Forest Survey regions in Ohio.

OHIO'S TIMBER HARVEST REVEALED IN STUMPS



KENNETH L. QUIGLEY, forest economist

Timber is an important resource in Ohio, and cutting records are an essential part of a forest resource appraisal. However, finding out just how much timber is cut in the State during any one year is a big job. Occasionally in the past, wood-using industries have been surveyed to determine the volume cut by species and product, but the variety of industries, the large number of small operations (including individual farmers) and lack of systematic records at small mills, makes an industry production survey difficult and costly. Production varies from year to year, so an industry survey for a particular year may not be representative. Moreover, an industry survey does not give direct information on size of timber cut, acreage cutover, source of the timber, or kind of stand from which timber came. These difficulties have prompted consideration of other ways to obtain cutting information.

Recently a new method for determining timber cut--measuring stumps on logged areas--has been tried.^{1/} This method provides some hitherto unavailable information and, when combined with inventory plot work, costs less than the older system.

^{1/} Quigley, Kenneth L., "Estimating volume from stump measurements." Cent. States Forest Expt. Sta. Tech. Paper 142, 5 pp., 1954.

To test this method, the Central States Forest Experiment Station collected stump data during 1951, 1952, and 1953 throughout Ohio as a part of the statewide forest survey (fig. 1). The Station also conducted a conventional industry canvass of timber production for 1951. The stump-survey data are shown in this report. In addition, certain information from the industry canvass that was not available from the stump survey is presented.

STATEWIDE TIMBER HARVEST

Since 1900, annual lumber production in Ohio has ranged from less than 100 million board-feet during the early 1930's to more than 500 million board-feet in years of high demand. According to the recently completed stump survey, from 1949 to 1953 the average sawtimber volume harvested annually was approximately 330 million board-feet (International 1/4-inch log rule). As rough, green lumber, this timber would have a value of about 20 million dollars. Although most of the timber was cut for lumber, some was cut for veneer, staves, and handles. In addition to the sawtimber trees cut, smaller quantities of pole-size trees were cut for other products such as fence posts, mine timbers, pulpwood, and fuelwood.



Figure 1.--Stumps of trees cut during the 3 years previous to the survey were measured on forest plots taken throughout the State.

Some 248,000 acres were cut each year. This is about 4 1/2 percent of the total commercial forest land and indicates that Ohio's forests are cut over about every 20 to 25 years. Very little of the area is clear cut. Average cut per acre was approximately 1,300 board-feet from sawtimber trees^{2/} and 0.3 cord from poletimber trees^{3/}. As might be expected, cutting from sawtimber stands accounted for 82 percent of the volume cut and 70 percent of the area cut. Another 25 percent of the area cut was in poletimber stands; cutting in this size class accounted for 14 percent of the volume harvested. The remaining 4 percent of the cut came from the smaller stand-size classes.

Trees ranging in size from 5 to more than 30 inches in diameter were cut. However, 70 percent of the volume came from trees larger than 14 inches in diameter. Distribution of the volume cut by tree classes was as follows:

| <u>Tree diameter</u> <u>class</u> (Inches) | <u>Cubic volume</u> <u>distribution</u> (Percent) |
|--|---|
| 5 - 10 | 7.6 |
| 11 - 14 | 22.4 |
| 15 - 18 | 25.8 |
| 19 - 22 | 18.6 |
| 23 - 26 | 15.1 |
| 27 and larger | <u>10.5</u> |
| | 100.0 |

The cut was well distributed among the important timber trees (table 1). White oak was the most important single species; all oaks together accounted for 46 percent of the volume cut. Except for post species, 80 percent or more of the volume came from sawtimber trees. Approximately 85 percent of the volume cut from post species (largely black locust with some sassafras, catalpa, osage orange, and mulberry) was from poletimber trees.

^{2/} Sawtimber tree.--A live softwood (coniferous) tree at least 9.0 inches d.b.h. (diameter at breast height) or live hardwood (deciduous) tree of commercial species at least 11.0 inches d.b.h., with a sound butt log at least 8 feet long, or with at least half of the gross volume of the tree in sound material.

^{3/} Poletimber tree.--A live, sound tree of commercial species at least 5.0 inches d.b.h. but less than sawtimber size that is now merchantable or gives promise of becoming merchantable.

Lumber is by far the most important timber product harvested in Ohio (fig. 2); it accounts for more than 60 percent of the cut. Other important products harvested are fuelwood, fence posts, and cooperage bolts (fig. 3).

Although the overall volume of timber cut reported here is based on the stump survey, the distribution of the cut by product was obtained from the timber industry canvass (table 2). Many of the minor industries were canvassed 100 percent. Special studies and the stump survey provided information on the volume of merchantable timber that was cut or damaged in logging operations but which was not used for any product. This volume is called woods waste.

TIMBER CUT BY REGIONS

Data were assembled for five geographic regions of the State (frontispiece). Area cut over annually in each region was as follows:

| <u>Region</u> | <u>Commercial</u> | <u>Forest area cut over</u> | |
|--------------------|--|-----------------------------|------------|
| | <u>forest area</u> (Thousand acres) | (Thousand acres) | (Percent) |
| South-central Ohio | 1,243 | 56.7 | 4.5 |
| Southeastern Ohio | 965 | 44.7 | 4.6 |
| East-central Ohio | 995 | 45.1 | 4.5 |
| Northeastern Ohio | 1,004 | 39.5 | 3.9 |
| Western Ohio | <u>1,189</u> | <u>62.3</u> | <u>5.2</u> |
| Total | 5,396 | 248.3 | 4.6 |



Figure 2.--Much of the timber cut in Ohio today is manufactured into lumber by circular sawmills such as this.

Large Timber Comes from Western Ohio

The diameter of trees cut varied greatly among the regions. About 40 percent of the volume cut from trees more than 18 inches in diameter came from western Ohio (table 3). In contrast more than 35 percent of the volume of poletimber cut in the State came from the northeastern region where a good deal of timber is cut for car blocking and other low-quality products.

Oaks Most Important Species

The species of trees cut also varied among the regions (table 4). Oaks were important everywhere; however, they ranged from 24 percent of the cut in northeastern Ohio to 73 percent in southeastern Ohio. Beech and maple accounted for 41 percent of the cut in northeastern Ohio but only 4 percent in south-central Ohio. Elm was of most importance in western Ohio where it accounted for 24 percent of the volume cut. Some species were reported in only part of the State. Among these were: black cherry reported only in east-central and northeastern Ohio, sycamore and cottonwood reported only in western and northeastern Ohio, and southern yellow pine reported in the south-central and southeastern parts of the State.

Cut Greatest in Northeastern Ohio

On the cutover area, an average of 1,286 board-feet of sawtimber was cut per acre. The average volume cut from all trees was 236 cubic feet per acre. Number of trees cut per acre varied from 1 to 140; the average was 11. In northeastern Ohio, the cut per acre was about one-third greater than in other parts of the State. Also the cut of poletimber trees per acre was from 2 to 4 times greater in northeastern Ohio than it was in the remainder of the State (table 5).

Figure 3.--Fence posts
are the main market
for black locust
timber cut in Ohio.



APPENDIX

Usefulness of a Stump Survey

A stump survey, carried on as a part of a forest resource survey, has certain advantages over a conventional industry canvass. The costs in this case added less than 5 percent to the overall cost of the inventory field work. The canvass of wood-using industries, an entirely separate study, required many field contacts and cost much more than the stump survey.

In addition to lower cost, the stump survey has several other advantages. It gives detailed information on the size and species of trees cut, the acreage of forest land cut over, and the average as well as the maximum volume cut per acre. An industry canvass usually does not yield this kind of information. Also an estimate covering a 5-year period should be more representative than an industry canvass for a single year. Finally a stump survey shows where within the State the cutting was done.

On the other hand, a stump survey does not provide certain information that is usually obtained from an industry survey. No measure of the timber cut from nonforest land is obtained. Nothing is learned of the size, number, and location of wood-using industries in a State or their volume requirements and quality specifications. Moreover, stump-survey information on the kind of products harvested is not very detailed or accurate.

From the Ohio study, it appears that the two kinds of timber-cut surveys supplement each other. Each provides some information that the other does not provide or provides only sketchily. A stump survey gives a reasonably good picture of annual timber cut. Preferably, however, it should be used to check and amplify information obtained from industry sources. It may eliminate the need for canvassing farmers and other miscellaneous cutters of fuelwood, posts, and farm timbers. This has been the least satisfactory phase of the industry survey.

Reliability of the Data

Statistical analysis of the stump information in Ohio shows a sampling error of 9.5 percent for the total volume cut. Since the percentage error increases with each subdivision of the total, small volumes may have large errors and may only indicate relative magnitudes. The sampling error is based on the number of plots examined and the variability in volume cut per plot. It does not include errors in volume tables, errors of measurement, or errors

of judgment. It is believed that stumps of sawtimber trees were accurately recorded on all plots. Occasional poletimber stumps may have been overlooked. No special difficulty occurred in judging whether timber had been cut within the selected period. Criteria were established for each species to determine the date of cutting. Where possible, local inhabitants were consulted. Mistakes are believed to be compensating. The estimate of tree size from stump diameter may have been conservative because cut trees usually average better than woods run, but errors should not be large.

The stump survey showed the total cut in Ohio to be 62.8 million cubic feet, which is 15 percent greater than the total obtained from the industry survey. In contrast the industry survey showed a greater cut from poletimber trees than did the stump survey. There are several possible explanations for these differences. Both surveys, of course, are subject to sampling errors. Moreover, the industry survey dealt with a single year, which may not have been representative of the 5-year period covered by the stump survey.

A reasonable presumption would be that the actual volume of cut would be somewhere between the two figures. An estimate based upon either figure should be sufficiently accurate to compare with annual growth in appraising the general forest situation in the State.

Table 1.--Timber cut by species and tree-size class

| Species | Volume cut | | | |
|-------------------------------------|-----------------------------------|---------------------|---------------------|---------|
| | From | From | | |
| | Sawtimber: | Poletimber: | | Total |
| | trees | trees | | |
| | Thousand bd.-ft. ^{1/} | Thousand cu. ft. | Thousand cu. ft. | Percent |
| Forked-leaf oak | 53,913 | 579 | 10,021 | 16.0 |
| Other white oaks | 23,738 | 381 | 4,667 | 7.4 |
| Black oak | 32,874 | 150 | 5,973 | 9.5 |
| Northern red oak | 20,966 | 58 | 3,673 | 5.8 |
| Other red oaks | 22,024 | 656 | 4,645 | 7.4 |
| Elm | 34,268 | 412 | 6,353 | 10.1 |
| Hard maple | 32,194 | 111 | 5,639 | 9.0 |
| Soft maple | 22,313 | 175 | 4,096 | 6.5 |
| Beech | 24,315 | 48 | 4,292 | 6.8 |
| Yellow-poplar | 17,660 | 245 | 3,418 | 5.4 |
| Ash | 14,138 | 349 | 2,867 | 4.6 |
| Hickory | 11,853 | 490 | 2,616 | 4.2 |
| Black cherry | 3,233 | 86 | 666 | 1.1 |
| Sycamore | 3,262 | 69 | 635 | 1.0 |
| Black walnut | 1,980 | 30 | 401 | .6 |
| Post species ^{2/} | 228 | 250 | 293 | .5 |
| Miscellaneous species ^{3/} | 11,858 | 346 | 2,554 | 4.1 |
| Total | 330,817 | 4,435 | 62,809 | 100.0 |

^{1/} International 1/4-inch log rule.

^{2/} Includes black locust, sassafras, catalpa, osage orange, and mulberry.

^{3/} Includes pine, redcedar, basswood, aspen, cottonwood, birch, and sweetgum.

Table 2.--Timber cut by product

| Product | : | Volume |
|-----------------------------|-----------------------------------|----------------|
| | : | |
| | <u>Thousand</u> <u>cu. ft.</u> | <u>Percent</u> |
| Sawlogs | 38,100 | 60.7 |
| Fuelwood | 6,700 | 10.7 |
| Fence posts | 3,100 | 4.9 |
| Cooperage bolts | 2,400 | 3.8 |
| Pulpwood | 2,300 | 3.7 |
| Veneer logs | 2,100 | 3.3 |
| Mine timbers | 1,600 | 2.6 |
| Miscellaneous ^{1/} | 800 | 1.3 |
| Woods waste | 5,700 | 9.0 |
| Total | 62,800 | 100.0 |

^{1/} Includes handle bolts, chemical wood, and farm timbers.

Table 3.--Average annual timber volume cut in Ohio by D.b.h. and region

| Region | : Poletimber trees: 11-18.9 inches : | | | | : Sawtimber trees | | | | All |
|---------------|--------------------------------------|---------|---------------------|---------|---------------------|---------|---------------------|---------|-----|
| | : D.b.h. : | | : 19-19+ inches : | | : D.b.h. : | | : | | |
| | Thousand cu. ft. | Percent | Thousand bd.-ft. | Percent | Thousand bd.-ft. | Percent | Thousand bd.-ft. | Percent | |
| South-central | 573 | 12.9 | 48,401 | 29.4 | 16,439 | 9.9 | 64,840 | 19.6 | |
| Southeastern | 447 | 10.1 | 28,055 | 17.0 | 16,605 | 10.0 | 44,660 | 13.5 | |
| East-central | 907 | 20.4 | 25,012 | 15.2 | 33,874 | 20.4 | 58,886 | 17.8 | |
| Northeastern | 1,636 | 36.9 | 42,540 | 25.8 | 34,871 | 21.0 | 77,411 | 23.4 | |
| Western | 872 | 19.7 | 20,759 | 12.6 | 64,261 | 38.7 | 85,020 | 25.7 | |
| Total | 4,435 | 100.0 | 164,767 | 100.0 | 166,050 | 100.0 | 330,817 | 100.0 | |

Table 4.--Species of timber cut by region
(In percent)

| Species | Region | | | | | State |
|------------------|----------|----------|----------|----------|---------|-------|
| | South- | South- | East- | North- | Western | |
| | central: | eastern: | central: | eastern: | | |
| Oaks | 64 | 73 | 46 | 24 | 38 | 46 |
| Beech and maples | 8 | 4 | 29 | 41 | 20 | 22 |
| Elm | 3 | 2 | 3 | 13 | 24 | 10 |
| Yellow-poplar | 11 | 12 | 4 | 4 | 0 | 5 |
| Ash | 2 | 2 | 5 | 5 | 8 | 5 |
| Hickory | 4 | 4 | 5 | 5 | 4 | 4 |
| Miscellaneous | 8 | 3 | 8 | 8 | 6 | 8 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 |

Table 5.--Average volume cut per acre in Ohio by region

| Region | Volume cut per acre | | | |
|---------------|---------------------|------------|------------|------------|
| | Sawtimber trees | All trees | | |
| | | Sawtimber | Poletimber | Total |
| | | | | |
| | Board-feet | Cubic feet | Cubic feet | Cubic feet |
| South-central | 1,106 | 193 | 10 | 203 |
| Southeastern | 965 | 165 | 10 | 175 |
| East-central | 1,260 | 211 | 20 | 231 |
| Northeastern | 1,886 | 321 | 41 | 362 |
| Western | 1,318 | 219 | 14 | 233 |
| | | | | |
| State average | 1,286 | 218 | 18 | 236 |

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